

C-6.12 Use solubility rules to write net ionic equations for precipitation reactions in aqueous solution.

Revised Taxonomy Level 3.2 C<sub>A</sub> **Apply (use) procedural knowledge**

**Students did not study this concept in physical science**

**It is essential for students to**

- ❖ Understand and use a hierarchical list of solubility rules to predict whether a compound is soluble or insoluble in aqueous solution.
  - Most sodium, potassium, and ammonium compounds are soluble in water
  - Most nitrates, acetates, and chlorates are soluble.
  - Most chlorides are soluble, except those of silver, mercury (I), and lead. Lead (II) chloride is soluble in hot water.
  - Most sulfates are soluble, except those of barium, strontium, and lead.
  - Most carbonates, phosphates, and silicates are insoluble, except those of sodium, potassium, and ammonium.
  - Most sulfides are insoluble, except those of calcium, strontium, sodium, potassium, and ammonium.
- ❖ Predict the formation of a precipitate when aqueous solutions of two soluble ionic compounds are mixed.
  - Write the possible double-replacement reaction
    - ◆  $\text{Zn}(\text{NO}_3)_2(\text{aq}) + (\text{NH}_4)_2\text{S}(\text{aq}) \longrightarrow \text{ZnS}(\text{?}) + 2\text{NH}_4\text{NO}_3(\text{?})$
  - Identify the precipitate
    - ◆ Zinc sulfide is not a soluble sulfide and is therefore a precipitate
    - ◆ Ammonium nitrate is soluble
  - Add the phase symbols to the products in the double replacement reaction
    - ◆  $\text{Zn}(\text{NO}_3)_2(\text{aq}) + (\text{NH}_4)_2\text{S}(\text{aq}) \longrightarrow \text{ZnS}(\text{s}) + 2\text{NH}_4\text{NO}_3(\text{aq})$
  - Write the overall ionic equation
    - ◆  $\text{Zn}^{+2}(\text{aq}) + 2(\text{NO}_3)^-(\text{aq}) + 2(\text{NH}_4)^+(\text{aq}) + \text{S}^{-2}(\text{aq}) \longrightarrow \text{ZnS}(\text{s}) + 2\text{NH}_4^+(\text{aq}) + 2\text{NO}_3^-(\text{aq})$
  - Write the net ionic equation.
    - ◆  $\text{Zn}^{+2}(\text{aq}) + \text{S}^{-2}(\text{aq}) \longrightarrow \text{ZnS}(\text{s})$

### Assessment

The revised taxonomy verb for this indicator is implement (use), the major focus of assessment will be for students to show that they can “apply a procedure to an unfamiliar task”. The knowledge dimension of the indicator, procedural knowledge means “knowledge of subject-specific techniques and methods” In this case the procedure for using a solubility table and the procedure for writing a net ionic equation. A key part of the assessment will be for students to show that they can apply the knowledge to a new situation, not just repeat problems which are familiar. This requires that students have a conceptual understanding the solubility rules and the process for writing net ionic equations.